Smart Push, Smart Pull, Sensor to Shooter in a Multi-Level Secure/Safe (MLS) Infrastructure

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Agenda

- The Vision: Seamless Data Flow
  - Sensor to Shooter
  - Sensor to Weapon
- Information Assurance Requirements of the Vision
- Design Guidance
- Reference Monitors
- Candidate Technologies
- Multiple Independent Levels of Security

The Vision: Sensor Fusion

- Each sensor type reveals different information, nominally (source: wikipedia.org):
  - Radar
  - Sonar and other acoustic
  - Infra-red / Thermal imagery
  - HDTV imagery
  - Seismic sensors
  - Magnetic sensors
  - Electronic Support Measures (ESM)
  - Phased Array
- Direct fusion from disparate sources results in better electronic information
  - More accurate
  - More complete
  - More dependable
- Indirect fusion merges electronic information with human input, merging:
  - ELINT: Electronic Intelligence
  - HUMINT: Human Intelligence
  - COMINT: Communications Intelligence
  - SIGINT: Signals Intelligence
  - IMINT: Imagery Intelligence

- Data derived from Direct Fusion *(contrived)*
  - What is it?
    - *T-72 Tank*
  - What is its condition?
    - *Lightly Damaged*
  - Where is it now?
    - *Longitude / Latitude*
  - Where has it been?
    - *Track*

- Characteristics of the Data
  - Multiple sensor devices on a surveillance platform
  - Sensor devices produce giga-gobs of raw data
  - Real-time transmission of all raw sensor data is impractical
  - Direct Fusion likely to be performed on the platform
  - Raw sensor data likely to be TOP SECRET
  - Derived data likely to be SECRET NOFORN
  - Data derived from Direct Fusion shared via ***Smart Push***

MLS Threat Database

- Surveillance platforms use SOA to populate MLS Web Server database
  - MLS Web Server database likely to be SECRET NOFORN
- Merged with data about each threat derived from Indirect Fusion:
  - Who controls it?
  - What is its threat potential?
  - What are its intentions?
- Many different types of users need the data:
  - Cleared US Military
    - At various levels
    - Multiple Communities of Interest
      - Services, Job Titles, etc.
  - Uncleared US Military in vicinity of the threat
  - Cleared coalition partners
    - At various levels
    - Multiple Communities of Interest for each partner
      - Canadian Army vs. UK Army Vs. UK Special Air Service
  - Uncleared coalition partners in vicinity of the threat

Theoretical Application: Command and Control

- SOA applications query the database searching for threats that meet certain characteristics ***Smart Pull***
  - Threat type
  - Threat nationality
  - Proximity to Coalition assets
- When an applicable threat is found, Command and Control personnel are notified ***Smart Push***
- The database is “Googled” by a human who makes the decision to prosecute the threat ***Smart Pull***
  - Humans make decisions that we would not defer to automation

Agile Forces Prosecute Threat

- Command and Control creates an ad-hoc group of available assets to prosecute the threat
- Ad-hoc task force requires ad-hoc networking for command and control
- Task force comprised of assets from various US services and coalition partners
- Multiple security levels and communities of interest
- Data shared according to security policy
  - Downgraded
  - Guarded
  - Filtered
- After threat prosecution, the task force is dissolved

Ad-hoc Networking Plumbing

- Fixed Black IP addresses for Web Servers
  - Communications via Type-1 HAIPE and/or JTRS
- Type-1 Crypto identifies and authenticates registrant
  - Also identifies and authenticates registrant’s Domain
- Registrant provides its own Black IP address
  - Also can provide credentials, geo-location, and capabilities
- Red side provides
  - Available services list
  - Red IP addresses for SOA / Web portals
  - Security Policy for information release to other members of the ad-hoc network or other ad-hoc networks

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Information Assurance Requirements

- Controlled Information Flow to users in multiple Security Domains
- Controlled Information Flow requires trustworthy enforcement of appropriate Security Policies.
- Security Policy enforcement must be trustworthy so that the mission is not compromised
  - Even more important, Information Sharing can't be allowed to endanger the Warfighters
  - Information Assurance is all about making sure that the Warfighters' systems can't be used against them.
- Trust is earned, never assumed
  - Certification and Accreditation are the ways to earn Trust.

What identifies a Security Domain?

- Nationality
  - US, Canada, UK, etc
- Classification/Clearance
  - SCI, TS, SECRET, UNCLASSIFIED, etc.
- Community of Interest
  - Functional Organization
- Geo-Location
  - Iraq, Afghanistan, CONUS, the Pentagon, etc.
- Safety
  - Critical, Non-critical, etc.

Information Flow Control Functions

- Cross Domain Server components that enforce the Security Policy
- Downgraders
  - Input: Data at a given classification level
  - Output: Data at a lower classification level
  - Rule Sets
    - Configured for each data stream
    - Field deletion and obfuscation
- Access Control Guards
  - IBAC: Identity Based Access Control
  - RBAC: Role Based Access Control
  - Protocol Specific Access Control
    - CORBA/GIOP
    - DDS
    - HTTP
    - etc.

Information Flow Control (cont'd)

- Content Guards
  - Document Type Specific Guarding (notional)
    - .doc .ppt .xls
    - .pdf .jpg .mpeg
    - .xml .avi .mov
    - .html .mp3 .ps/eps
    - .tex .dvi .rtf
  - Verify no Deleted Data in Document
  - Verify no Hidden Data under Overlay
  - No Non-displayed Annotation or Comments
  - Verify Release Markings
  - "Dirty" Word Search

.PDF File Guarding Failure

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- Italian Shooting Final Report (.pdf Guarding Failure)

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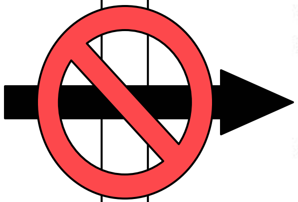

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Smart Pull Information Assurance

- “Googler” Characteristics
  - Nationality
  - Clearance
  - Job Title
  - Location
- Threat Characteristics
  - Classification of the Threat(s)
  - Location of the Threat
- Security Policies
  - Releasability of Threat Data
  - Down Grade Policy

Security Policy Definition

- Requires anticipation of the unauthorized events that the system must prevent
  - e.g., No SECRET cleared users allowed to read TOP SECRET information
- System Security Policy usually consists of a collection of sub-policies which define the security services offered by the system.
- Example sub-policy: User Access Control
  - “A correct user name, password, and fingerprint must be entered into the system prior to user access”

Communications Security Policy

- Notional Security Policy for Information Flows
  - P1A: There shall be no infiltration of data among flows
  - P1B: There shall be no infiltration of data within flows
  - P2A: There shall be no exfiltration among flows
  - P2B: There shall be no exfiltration within flows
  - P3: There shall be no unauthorized use of authorized flows
    - Example: No third party is allowed to cause information belonging to “A” to flow to “B” even if the security policy allows “A” to communicate with “B”
- Applicable to Security Enforcing components
  - HAIPE
  - JTRS
  - PCS
  - Etc.

Required Levels of Assurance

- High Robustness is, in general, equivalent to Common Criteria EAL6+
  - There is no official definition of High Robustness yet.
  - Working definition in SKPP V0.71 (draft)
- DCID 6/3 applies to all entities that process, store, or communicate intelligence information
  - An information system operates at Protection Level 5 when at least one user lacks any clearance for access to some of the information in that system
- DO-178B applies to software for airborne systems and equipment.
  - Software that can cause a catastrophic failure is certified at Level A
- There is significant overlap and synergy among these standards

The Real Hard Problems

- Interdomain Security Policy Management
  - How do we define it?
  - How do we update it?
  - How do we distribute it
- Domain Policy Management
  - How do we include a new actor into a domain?
  - How do we revoke privileges of an actor?
  - How do we detect and exclude a compromised actor?
- Threat-based Domain construction and destruction
  - Multilevel
  - Multinational
  - Multiple COIs

The Real Hard Problems (cont'd)

- Transparency
  - Warfighters are supposed to expend their resources on fighting wars, not enforcing security policies
  - If it is too hard to follow, nobody will follow it
    - "Get the job done" attitude
  - If it is too hard to administer, nobody will administer it
    - Security can be compromised

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Overall System Security Policy

- Bell-LaPadula to focus on Confidentiality
  - Read Down, Write Up
  - Protects against unauthorized disclosure
- Biba to focus on Integrity
  - Read Up, Write Down
  - Protects against unauthorized modification
- Other security policies:
  - Brewer-Nash (access control)
    - Information flow model provides controls to mitigate conflict of interest
  - Clark-Wilson (integrity)
    - Well formed transactions transition system from one secure state to another
  - Graham-Denning (rights)
    - Define rights on how subjects execute security functions on objects

Unauthorized Events

- Identify the unauthorized events that the system must prevent
- Typically, systems must protect against:
  - Unauthorized Disclosure
    - *Confidentiality*
  - Unauthorized Modification
    - *Integrity*
  - Unauthorized Access
    - *Access Control*
  - Masquerade or Replay
    - *Authentication*
  - Denial of Transmission or Reception
    - *Non-repudiation*
  - Denial of Service
    - *Availability*

Derived System Requirements

- Input: System Security Policy
- Input: Unauthorized Events
- Use these inputs to derive a list of requirements which the system must meet
- Result: A written System Requirements Document (SRD)
- When dealing with classified data, seek NSA IAD guidance
  - Engage them ***EARLY***
  - Engage them ***OFTEN***

Step 1: Assess Information Value

- Consult the *Information Assurance Technical Framework*
  - Best practices document, available on http://iatf.net
- Value assessed by evaluation the consequences of security policy violation with respect to:
  - Security
  - Safety
  - Financial Posture
  - Infrastructure
- The IATF identifies five levels:
  - **V1:** Negligible effect
  - **V2:** Minimal Damage
  - **V3:** Some Damage
  - **V4:** Serious Damage
  - **V5:** Exceptionally Grave Damage

Step 2: Determine Threat Levels

- Best practices also in the IATF
- Threats are ranked by assessing:
  - Capability
  - Resources
  - Motivation
  - Risk Willingness
- The IATF identifies seven levels:
  - **T1:** Inadvertent or accidental events
    Tripping over a power cord
  - **T2:** Minimal resources – willing to take little risk
    Passive, casual eavesdropper
  - **T3:** Minimal resources – willing to take significant risk
    Unsophisticated hacker
  - **T4:** Moderate resources – willing to take little risk
    Organized crime, sophisticated hacker, international corporations
  - **T5:** Moderate resources – willing to take significant risk
    International terrorists
  - **T6:** Abundant resources – willing to take little risk
    Well funded national laboratory, nation-state, international corporation
  - **T7:** Abundant resources – willing to take significant risk
    Nation-states in time of crisis

Step 3: Protection Mechanisms

- Confidentiality
  - Encryption algorithms
- Integrity
  - Hashing algorithms
- Access Control
  - Identification and Authentication
- Authentication
  - Certificates
- Non-repudiation
  - Digital Signatures
- Availability
  - Redundancy

Step 4: Strength and Assurance Level

- From the IATF, Strength of Mechanism and Assurance Level mapped to Information Value and Threat Level

Information Value	Threat Levels						
	T1	T2	T3	T4	T5	T6	T7
V1	SML1 EAL1	SML1 EAL1	SML1 EAL1	SML1 EAL2	SML1 EAL2	SML1 EAL2	SML1 EAL2
V2	SML1 EAL1	SML1 EAL1	SML1 EAL1	SML2 EAL2	SML2 EAL2	SML2 EAL3	SML2 EAL3
V3	SML1 EAL1	SML1 EAL2	SML1 EAL2	SML2 EAL3	SML2 EAL3	SML2 EAL4	SML2 EAL4
V4	SML2 EAL1	SML2 EAL2	SML2 EAL3	SML3 EAL4	SML3 EAL5	SML3 EAL5	SML3 EAL6
V5	SML2 EAL2	SML2 EAL3	SML3 EAL4	SML3 EAL5	SML3 EAL6	SML3 EAL6	SML3 EAL7

Step 5: Principle of Least Privilege

- Architecture Policy: INFOSEC boundaries shall be designed using the Principle of Least Privilege
- Principle of Least Privilege: Each subject is granted only the most restrictive set of privileges (or clearance) needed to perform its authorized tasks
  - Minimum memory footprint
    - Only what is needed and ***nothing more***
  - Minimum hardware features
    - Smallest capability set and ***nothing more***
  - Minimum invocation of rights
    - Only necessary privileges ***only when needed***
  - Maximum separation
    - Necessary data disclosed and ***nothing more***

Step 6: Utilize the Common Criteria

- Utilize the Functional Requirements in Part 2 to help define the system and meet the System Requirements Document
- Utilize the Assurance Requirements in Part 3
  - Configuration Management
  - Delivery and Operation
  - Development
  - Guidance Documents
  - Testing
  - Life Cycle Support
  - Vulnerability Assessment
  - Maintenance of Assurance

Software Development

- Use a defined/structured process (e.g., SEI/CMMI)
  - Produce software that does only its intended task and is evaluatable
  - NSA requires at least CMMI Level 3
- For software that is not security enforcing or security relevant
  - Develop the code with good quality control techniques, in small, well-structured units, and thoroughly test it

Trusted Software Development

- Code that is Security Enforcing or Security Relevant
- Develop the code from an abstract finite state machine (when it makes sense)
- Use formal tools (e.g. model checkers) to evaluate the state machine and other critical code
- Develop a mapping between the state machine and the code
- Boot process, with digitally signed copies of ALL software running on the system, should be stored in the system on ROM and protected accordingly
- Meet ALL Non-Trusted development requirements

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Reference Monitor Characteristics

- Common Criteria Definition (Version 2.2, Part 1, page 14)
  - The concept of an abstract machine that enforces TOE access control Policies
- The enforcement point for the Security Policy
- The Reference Monitor is *not* always a software module
- The Reference Monitor is an abstraction
- The best Reference Monitor is no Reference Monitor
  - Because the design of the system itself makes violation of the Security Policy impossible
    - (e.g., separation by air gap)
  - It isn't always practical, affordable, or achievable to design systems that way
    - Potentially user unfriendly
    - Cost
    - Size, Weight, and Power

Reference Monitors Must be NEAT

N

E

A

T

To be effective, Security Policy Enforcement must be:

- ***N*on-bypassable**
  - Security functions cannot be circumvented
- ***E*valuatable**
  - Security functions are small enough and simple enough for mathematical verification
- ***A*lways Invoked**
  - Security policy is enforced each and every time
- ***T*amperproof**
  - Subversive or errant code cannot alter the security data or functions

- Reference Monitor is the heart of the TOE Security Function (TSF)
  - TSF: TOE Security Function
  - TOE: Target of Evaluation
- Common Criteria class FPT: Protection of the TSF
- Decomposed into:

AMT	Underlying abstract machine test	**RPL**	Replay detection
FLS	Fail Secure	**RVM**	Reference mediation
ITA	Availability of exported TSF data	**SEP**	Domain separation
ITC	Confidentiality of exported TSF data	**SSP**	State synchrony protocol
ITI	Integrity of exported TSF data	**STM**	Time stamps
ITT	Internal TSF data transfer	**TDC**	Inter-TSF data consistency
PHP	TSF physical protection	**TRC**	Internal TOE TSF data replication consistency
RCV	Trusted Recovery	**TST**	TSF self test

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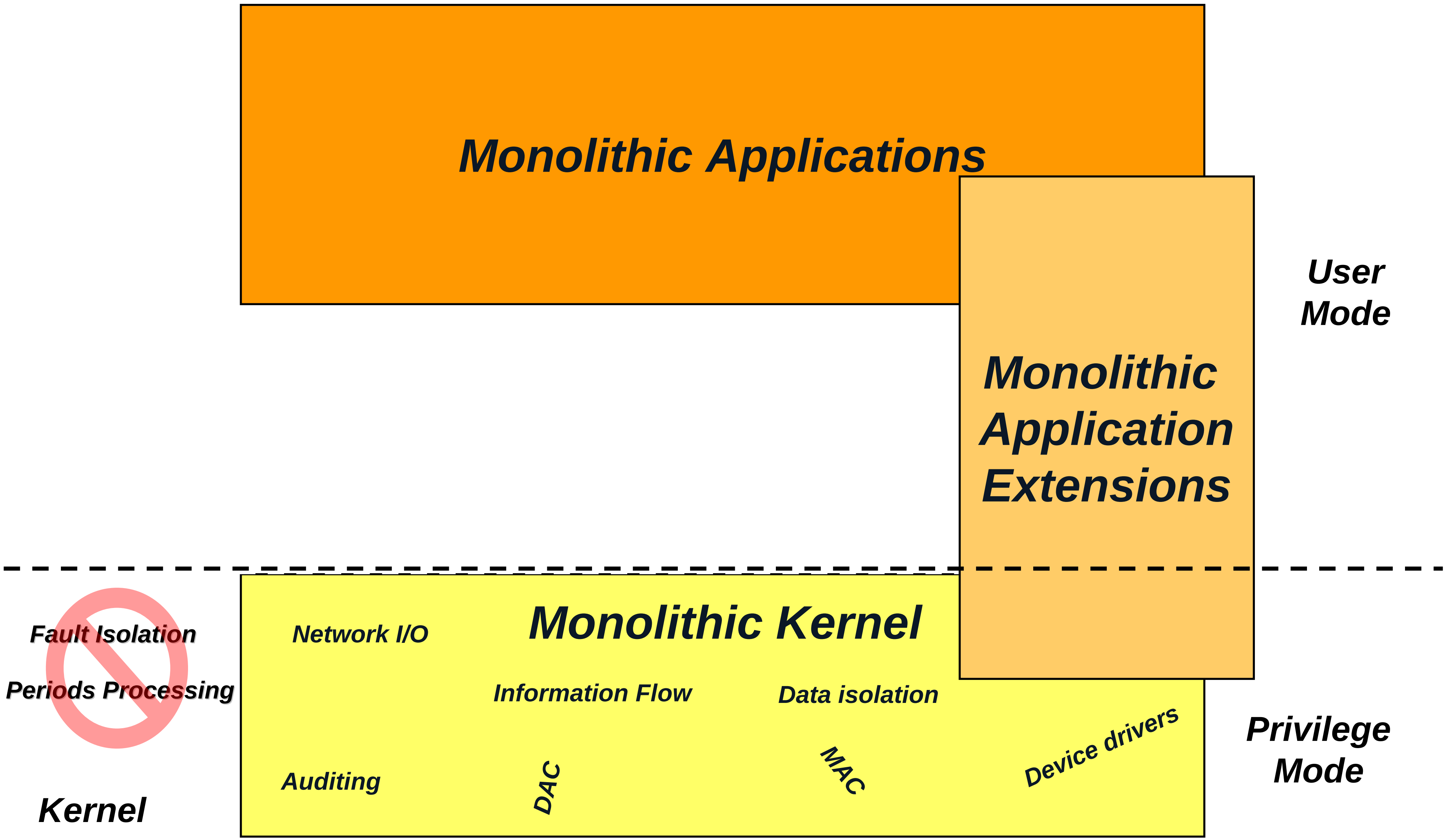
Monolithic Security Kernel

- All security is policy is performed by the security kernel
  - Originally for performance reasons
  - No other was to ensure enforcement is non-bypassable
- As security policy becomes more complex:
  - Code grows in security kernel
  - Certification efforts become unmanageable
  - Evaluatability of kernel code decreases
  - Maintainability of kernel code decreases
  - Policy decisions can be based on incomplete or unauthenticated information

Monolithic Security Kernel



Fail-first, Patch-later

- Most commercial computer security architectures
  - The result of systems software where security was an afterthought
    - Operating systems
    - Communications architectures
  - ***Reactive*** response to problem
    - Viruses, Worms, and Trojan Horses
    - Hackers and Attackers
    - Problems are only addressed ***after*** the damage has been done
  - Inappropriate approach for mission critical systems
    - Does not safeguard information or the warfighter
    - ***Proactive*** measures are required to ***prevent*** damage

High Assurance Monolithic Kernel?

Smart Push, Smart Pull, Sensor to Shooter in a Multi-Level Secure/Safe (MLS) Infrastructure

Monolithic Applications

Monolithic Application Extensions

User Mode

MLS/CDS Requires Systems Evaluatable At High Assurance!

Unevaluatable At High Assurance

Monolithic Kernel

Fault Isolation

Periods Processing

Network I/O

Information Flow

Data isolation

Auditing

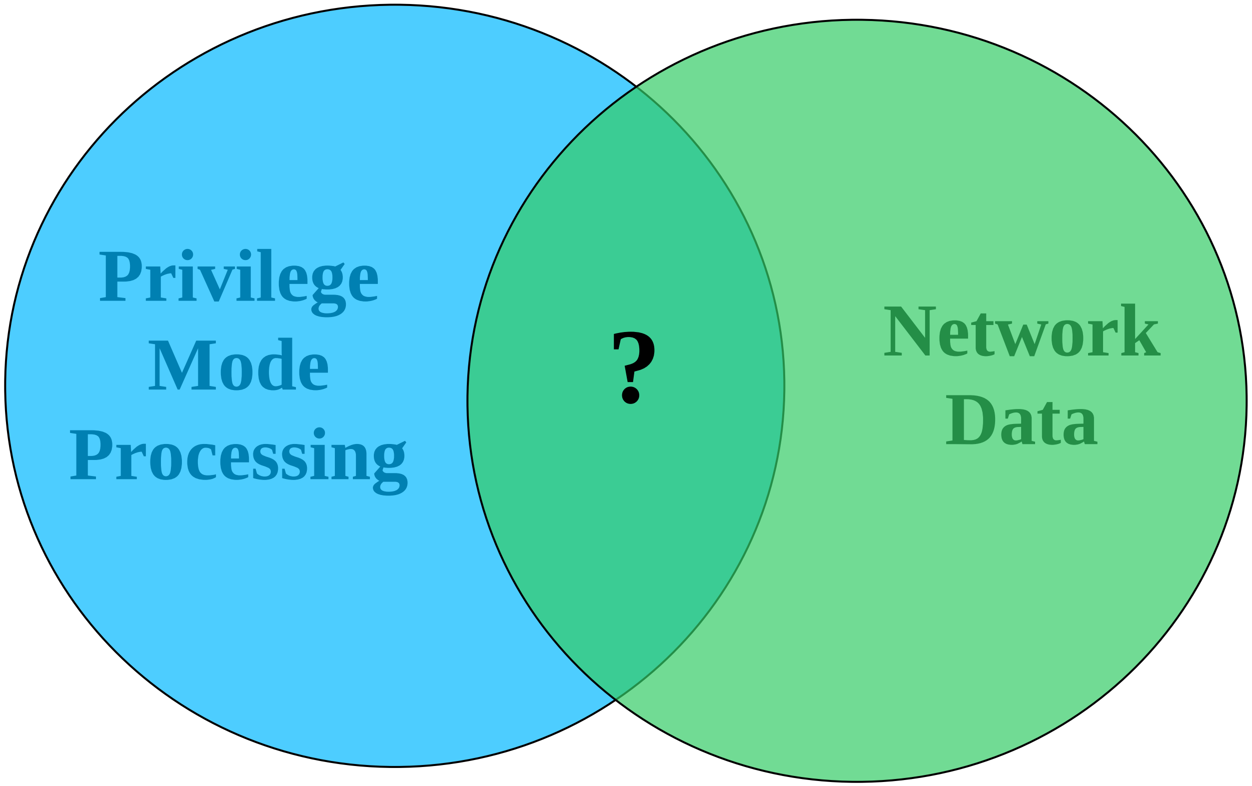
DAC

MAC

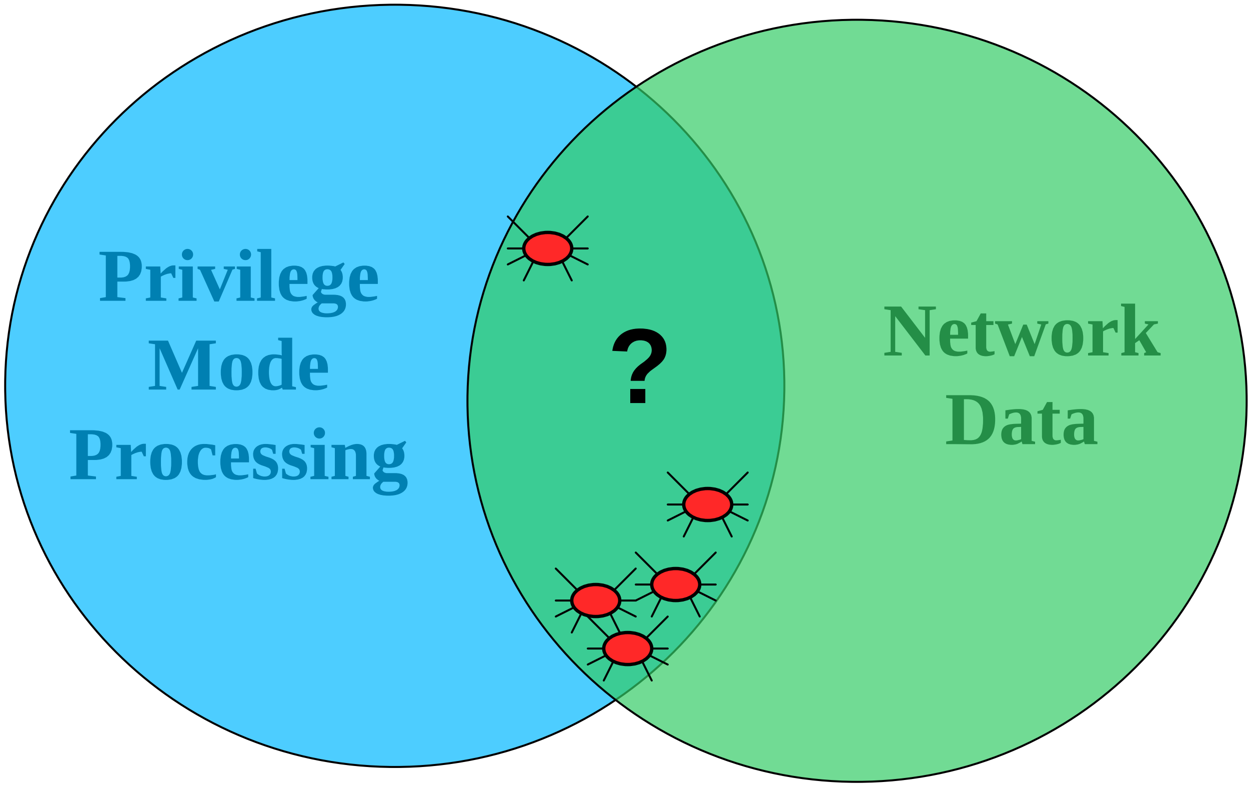
Device drivers

Kernel

Privilege Mode



What happens when network headers are processed in privilege mode?

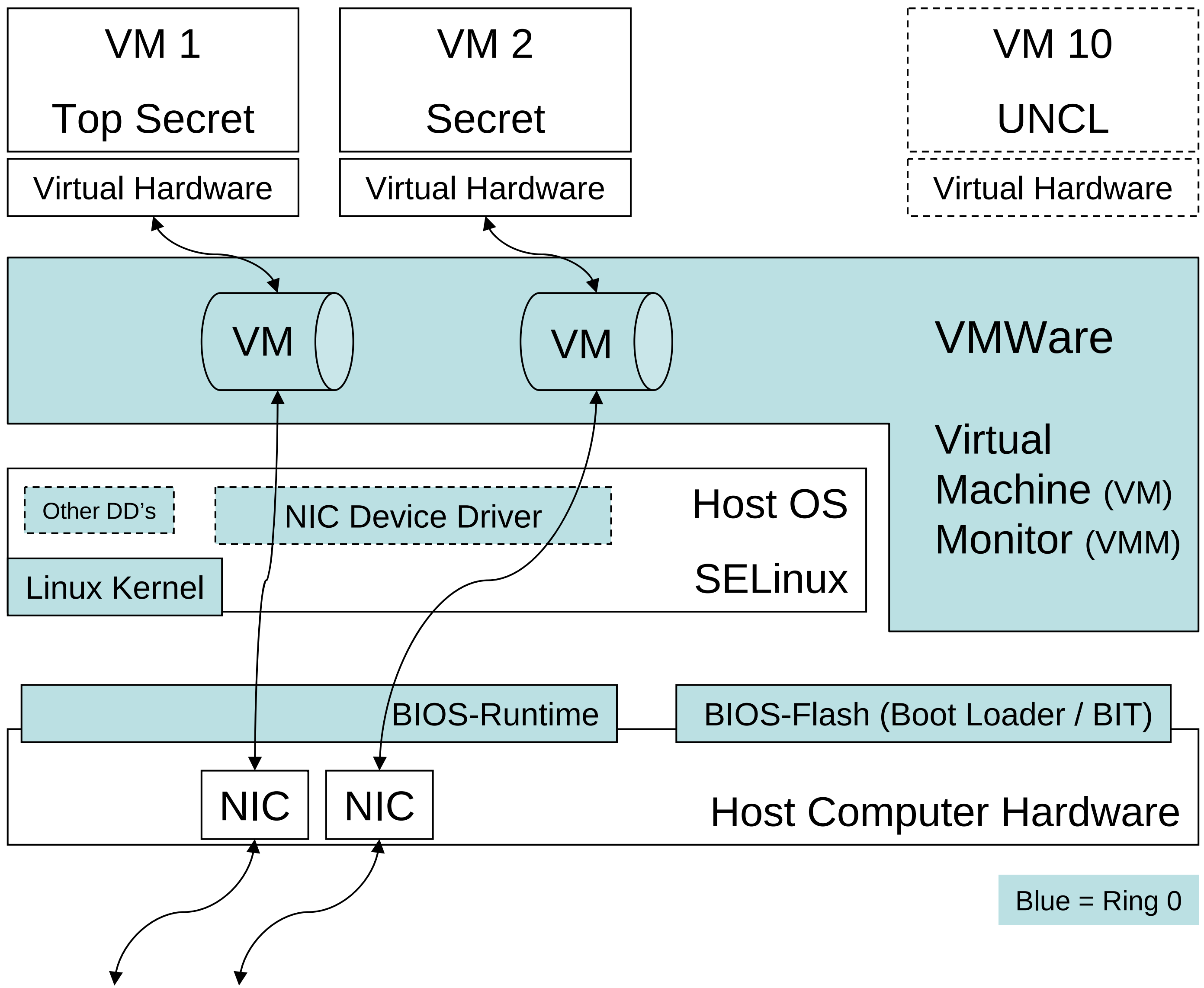


Wild Creatures of the Net: Worms, Virus, . . .

NetTop

- Developed by NSA “R” Group for internal use, later licensed for unlimited distribution by HP and TCS
- Assembled from readily available software components
  - Device drivers from SELinux
  - Separation from VMware®
  - Virtual machines run Windows® or Linux®
  - Virtual machines communicate via virtual NICs
- Originally approved by the NSA for internal use to provide separation of TOP SECRET from SECRET without respect to compartments or need to know, only for users with TOP SECRET clearance
  - Intended to connect internal NSANet (TS) to SIPRNET (S) for users with TS clearance
- Accredited by NSA to run in DCID 6/3 PL4 environments
  - Extends original certification to allow users with Secret clearances

NetTop Architecture



NetTop Characteristics

- Readily available on generic PC hardware
  - A desktop solution, no plans for embedded support
  - Not applicable to weapon systems or platforms
- Meets NSTISSP-11 validation requirements
  - Not certified via CCEVS (NIAP)
  - CCRA not applicable
- Applicable to low threat environments
  - Trusted people in secure facilities
- Provides a moderately robust level of separation
  - COTS components do not meet least privilege high robustness design requirements

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Multiple Independent Levels of Security (MILS)

- Three distinct layers (John Rushby, PhD)
- **Separation Kernel**
  - Separate process spaces (partitions)
  - Secure transfer of control between partitions
  - Really small: 4K lines of code
- **Middleware**
  - Application component creation
  - Provides secure end-to-end inter-object message flow
    - Device Drivers, File Systems, Network Stacks, CORBA, DDS, Attestation, …
- **Applications**
  - Implement application-specific security functions
    - Firewalls, Cryptomod, Guards, Mapplet Engine, CDS, Multi-Nation Web Server, etc.

Separation Kernel

- The only code that runs in privileged mode
- **Microprocessor Based**
  - Multi-Core Time and Space Multi-Threaded Partitioning
  - Data Isolation
  - Inter-partition Communication
  - Periods Processing
    - Resource Sanitization
  - Minimum Interrupt Servicing
  - Semaphores
    - Multi-Core Synchronization Primitives
  - Timers

And nothing else!

MILS Middleware

- **Traditional RTOS Services**
  - Device Drivers
  - File Systems
  - Token and Trusted Path
- **Traditional Middleware**
  - CORBA (Distributed Objects)
  - Data Distribution (Pub-Sub)
  - Web Services
- **Partitioning Communication System (PCS)**
  - Global Enclave Partition Comm
    - TCP, UDP, Rapid-IO, Firewire, …

The Whole Point of MILS

Really very simple:

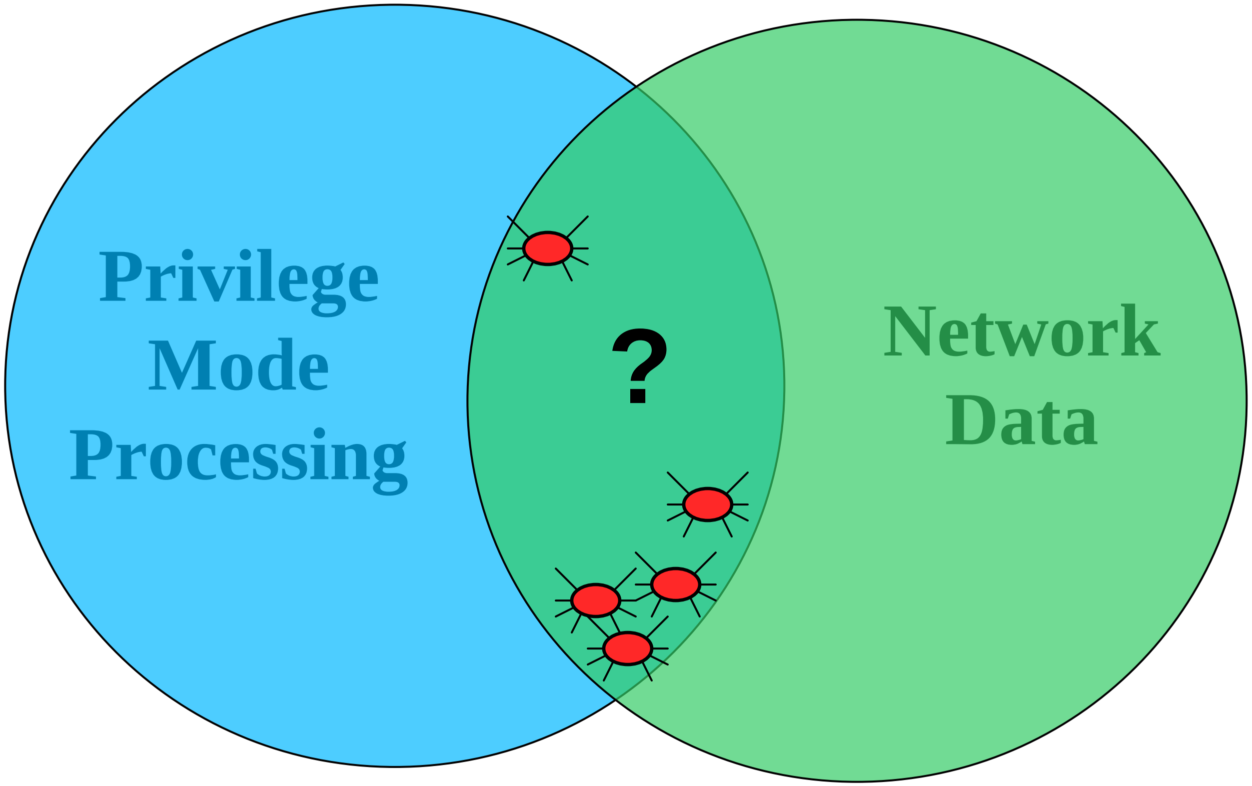
- Dramatically reduce the amount of *security critical code*

So that we can

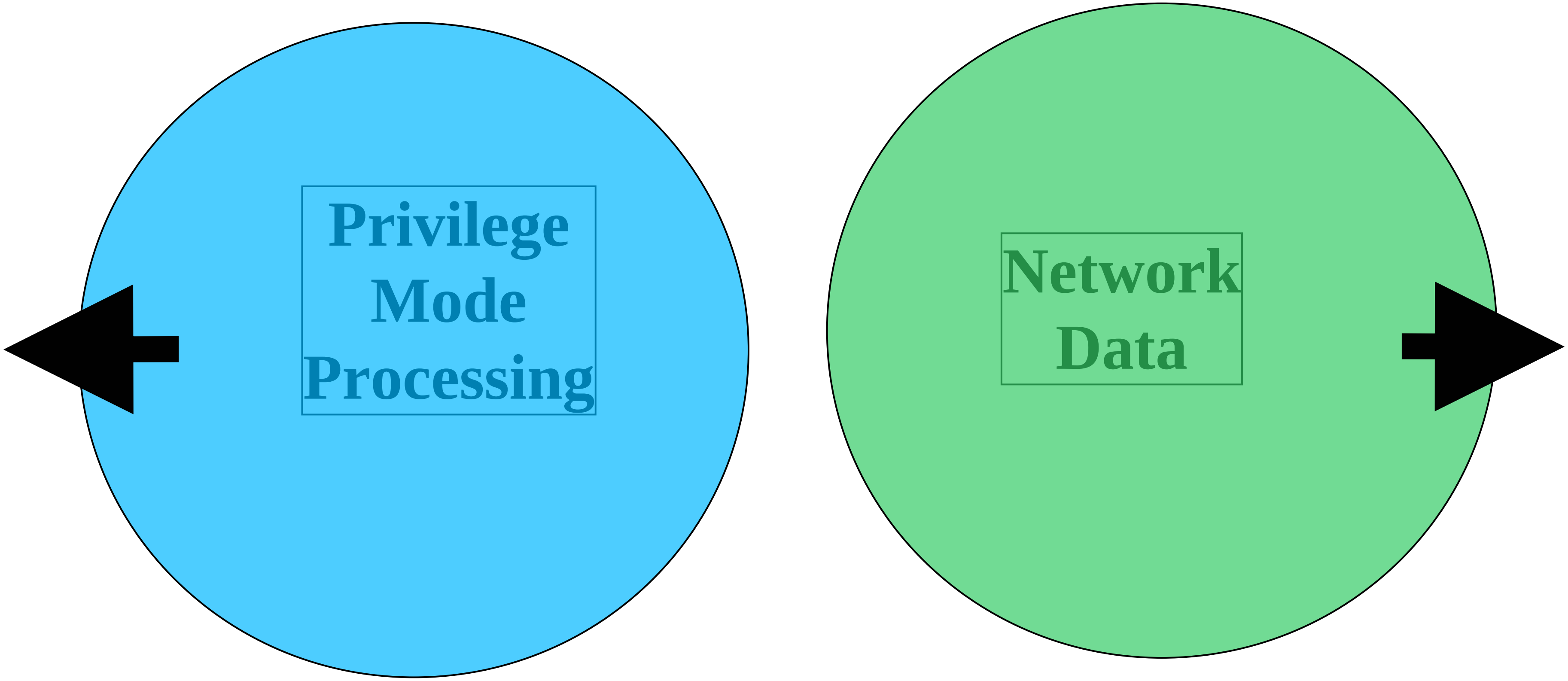
- Dramatically increase the scrutiny of *security critical code*

To make

- Development, certification, and accreditation more practical, achievable, and affordable.



Wild Creatures of the Net: Worms, Virus, . . .



Under MILS, network header and privilege mode processing are separated

MILS Architecture Evolution

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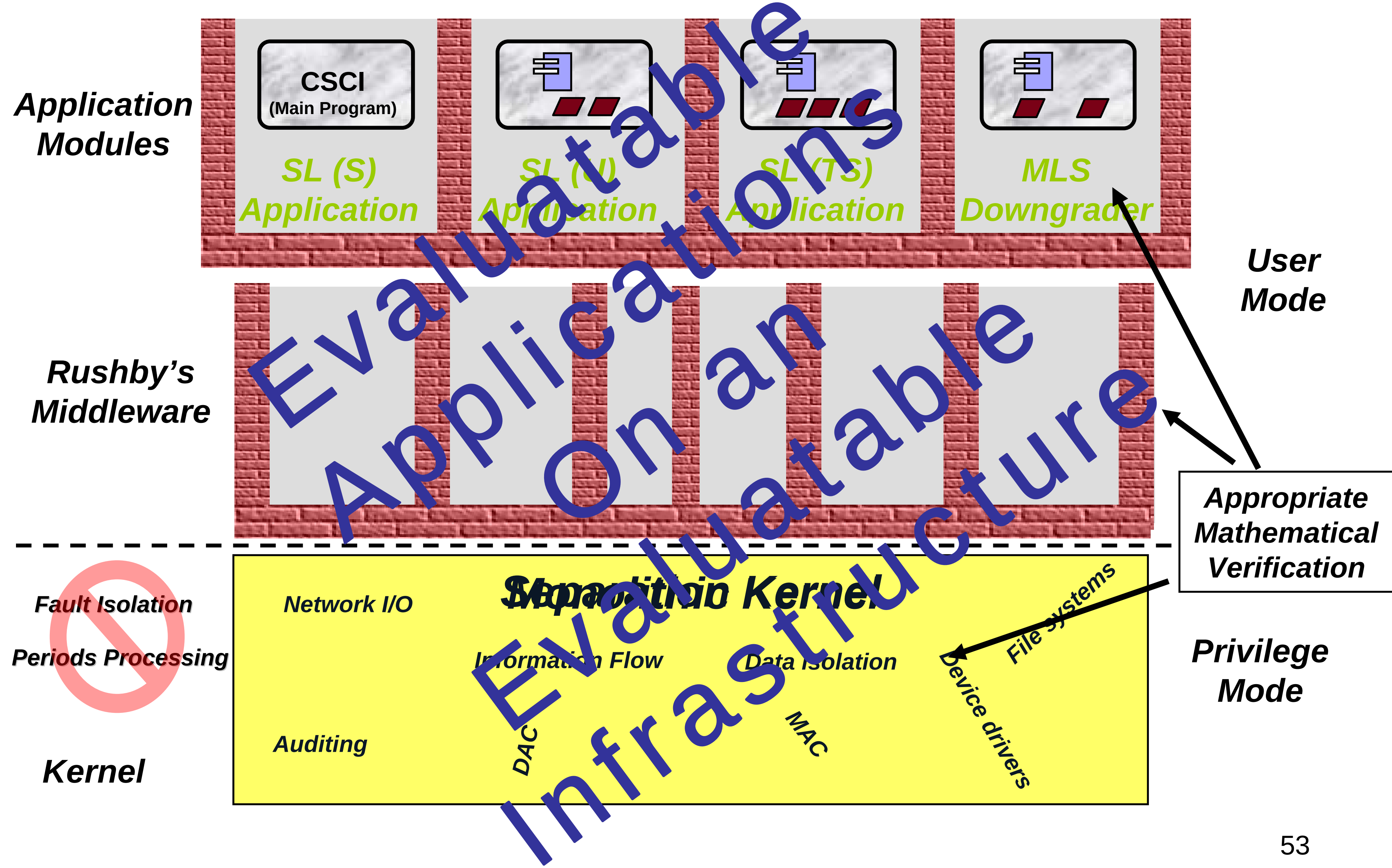
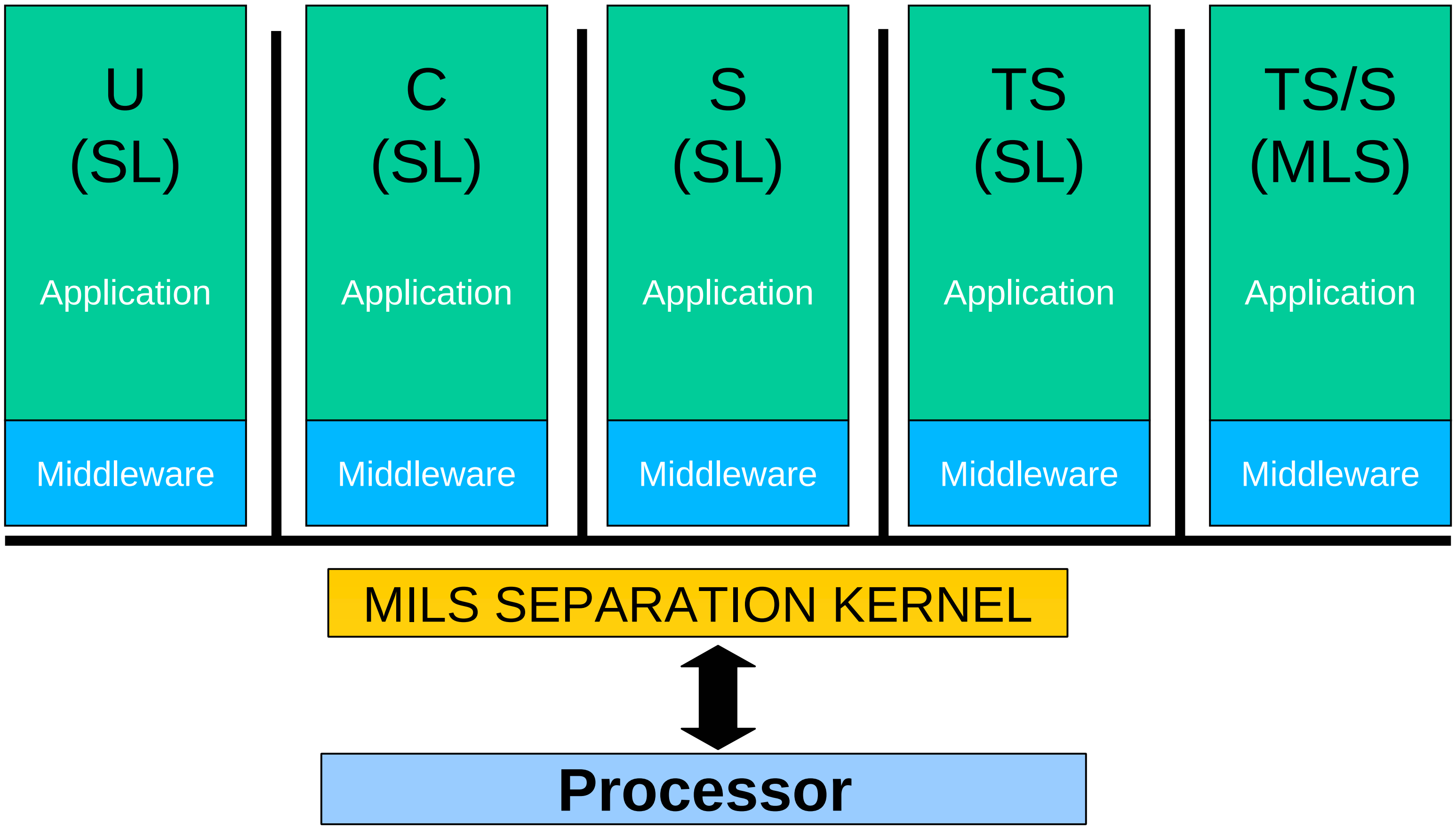
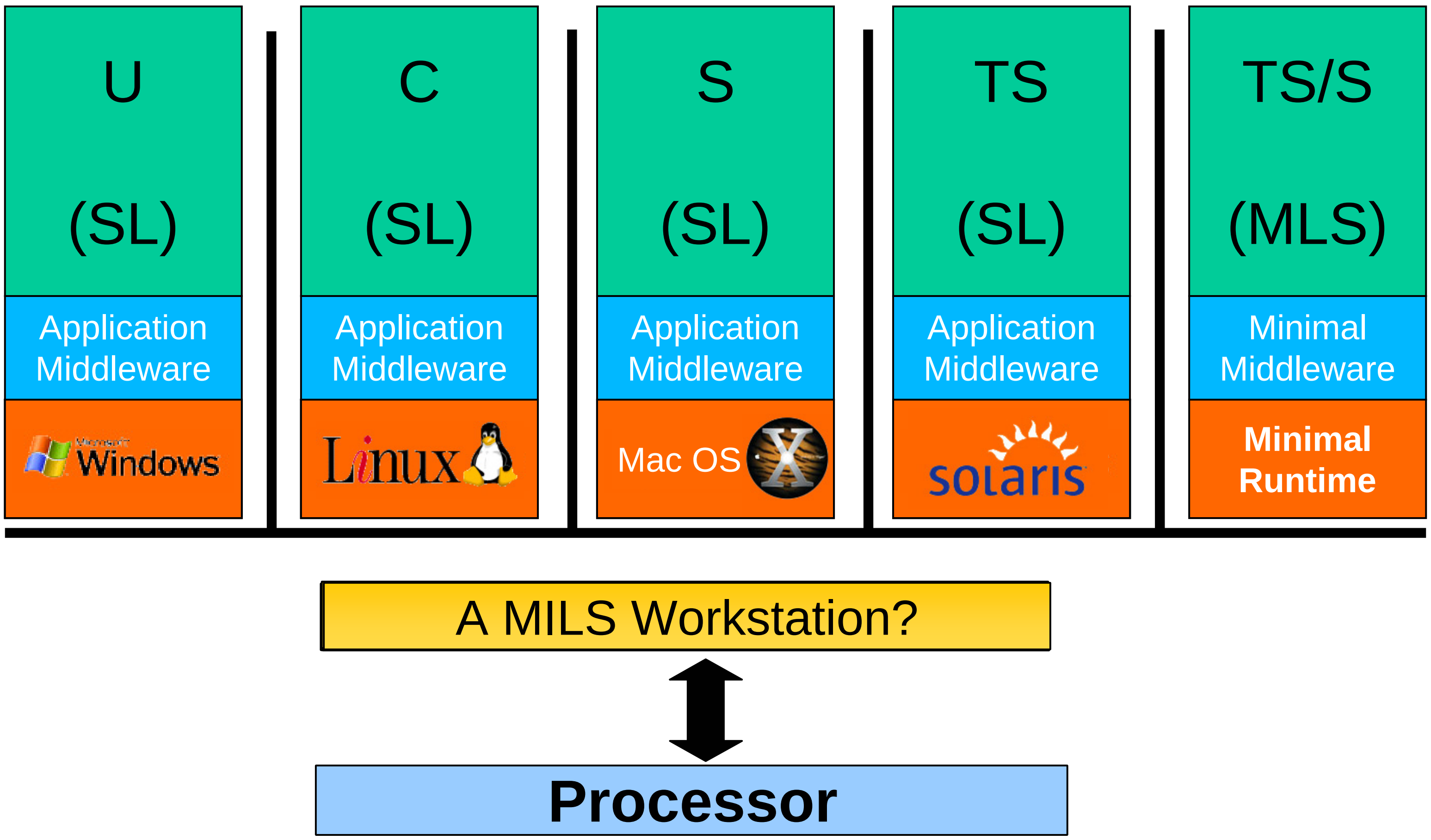


The MILS Architecture



Guest OS Architecture

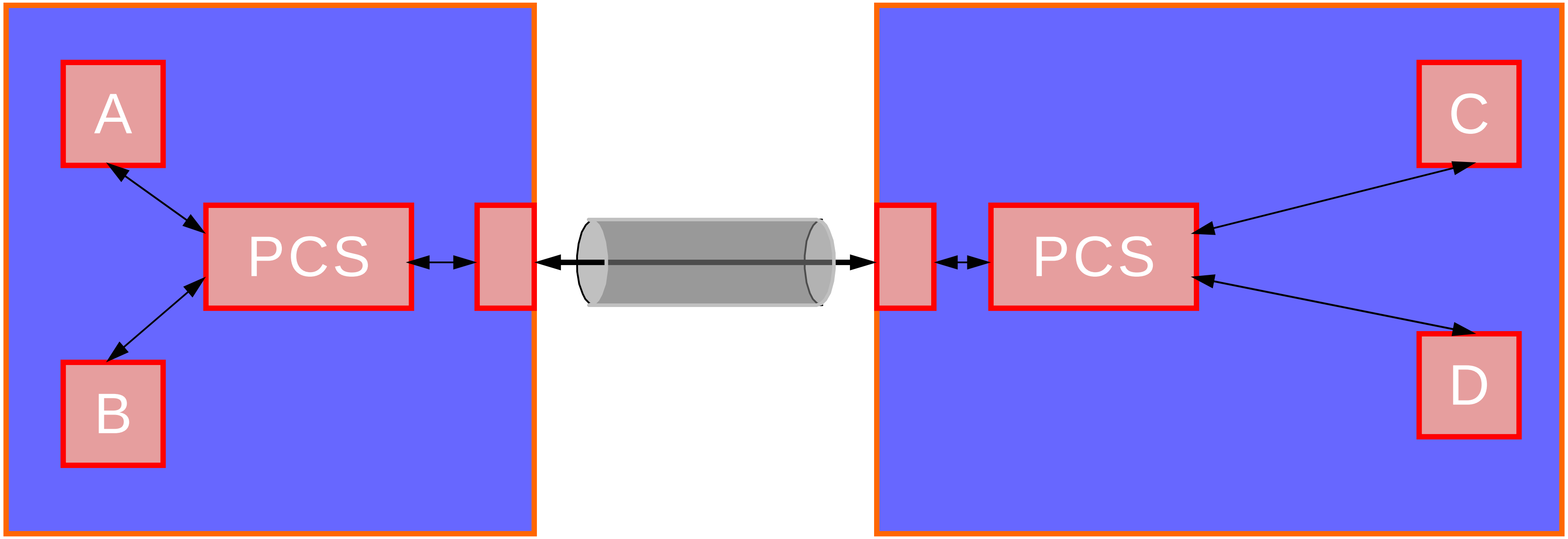


Distributed Security Requirements

- Extend single node security policy enforcement to multiple nodes
- Do not add new threats to data Confidentiality or Integrity
- Enable distributed Reference Monitors to be **NEAT**
- Optimal inter-node communication
  - Minimizing added latency (first byte)
  - Minimizing bandwidth reduction (per byte)
- Fault tolerance
  - Security infrastructure must have no single point of failure
  - Security infrastructure must support fault tolerant applications

Partitioning Communications System

- Part of MILS Middleware
- Responsible for all communication between MILS nodes
- Specific Requirements:
  - Strong Identity
    - Nodes, applications, and application instances
    - Separation of Levels/Communities of Interest
  - Secure Configuration of all Nodes in Enclave
  - Bandwidth provisioning & partitioning
  - Secure Clock Synchronization
  - Suppression of Covert Channels
    - Network resources: bandwidth, hardware resources, buffers
  - Secure Loading: signed partition images


A
PCS
B
C
PCS
D

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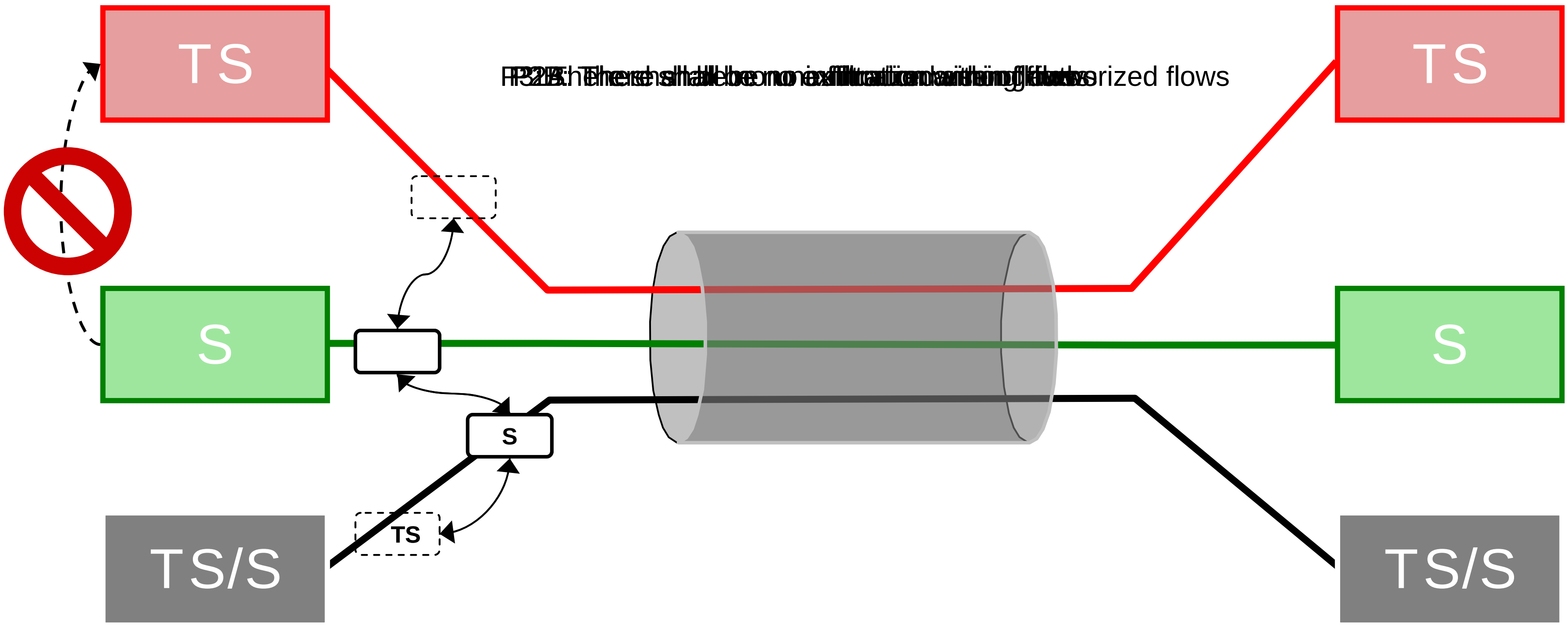
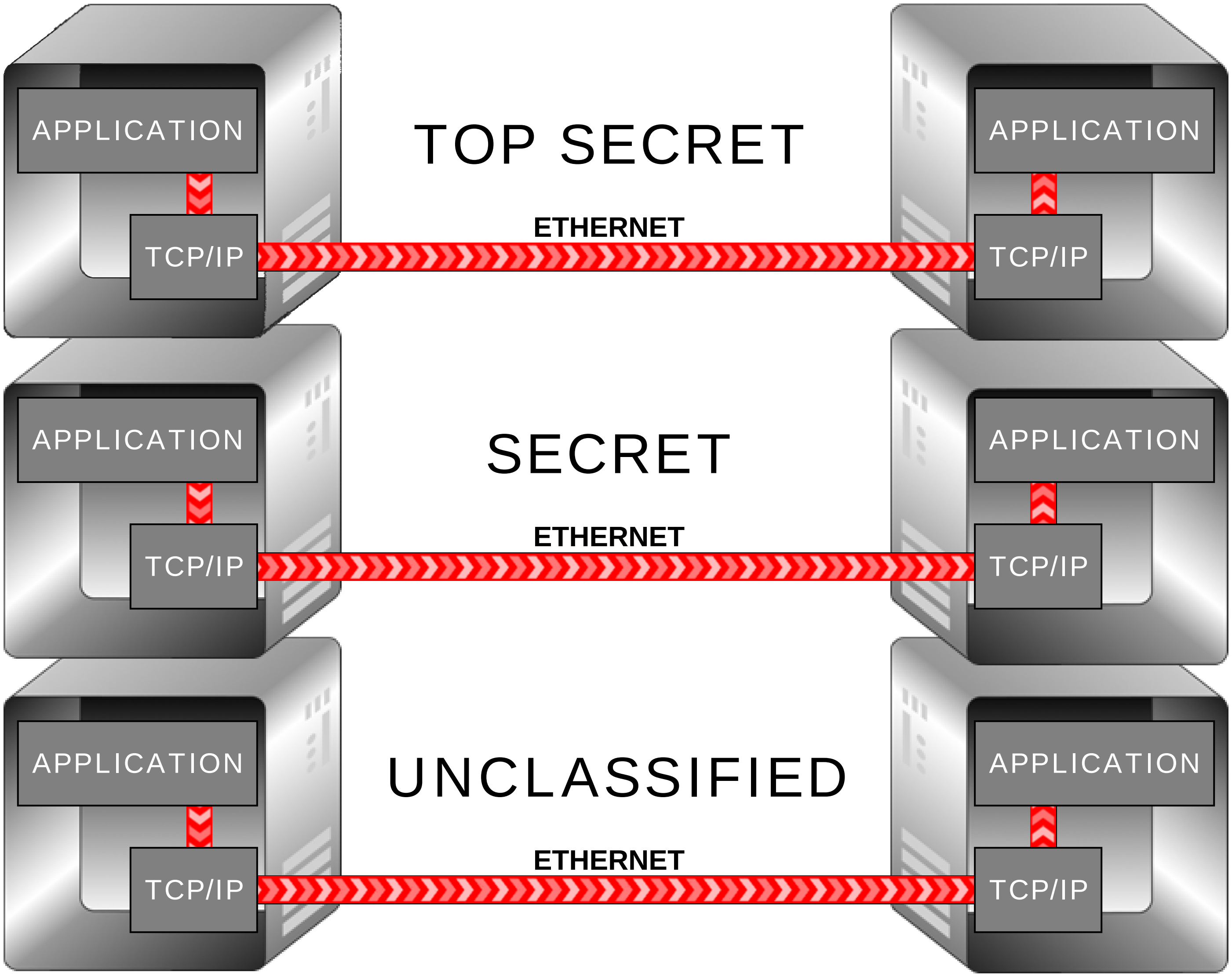

TS
TS
S
S
S
TS
TS/S
TS/S

PCS is Trusted Plumbing

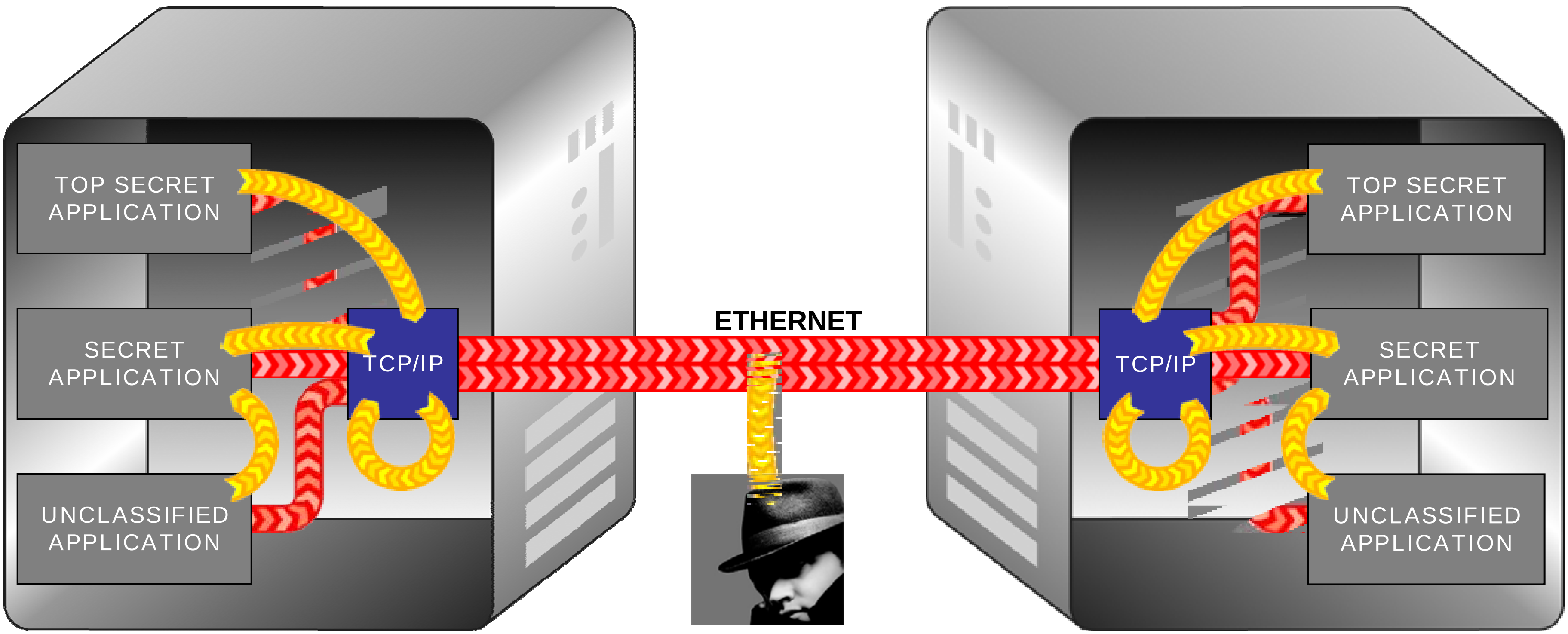
- PCS assumes the network can't be trusted
  - Leverage COTS stacks, NICs, media, switches, and routers
- PCS provides trusted data flow among distributed applications and guards
  - Code that was typically duplicated from partition to partition
- Access guards and data guards can be tightly focused on the data owner's specific requirements
- Trusted data flow enables higher assurance
  - Smaller code body
  - Simpler logic
  - Formal methods more practical

Air Gap Works But.... Costly, Inflexible, & Awkward



Combining Levels On Medium Assurance Platforms Is Unsafe

Smart Push, Smart Pull, Sensor to Shooter in a Multi-Level Secure/Safe (MLS) Infrastructure



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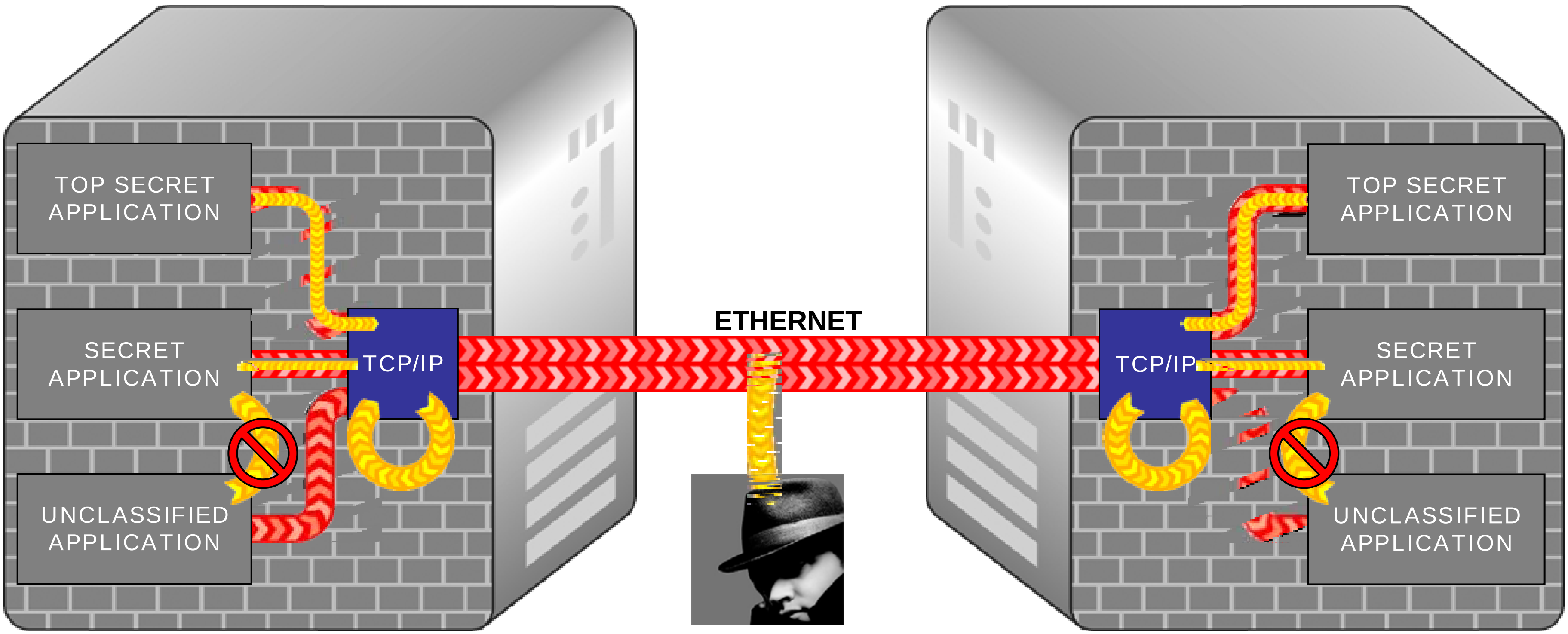
Vulnerabilities

MILS Separation Kernels Counter Most Internal Threats

Smart Push, Smart Pull, Sensor to Shooter in a Multi-Level Secure/Safe (MLS) Infrastructure



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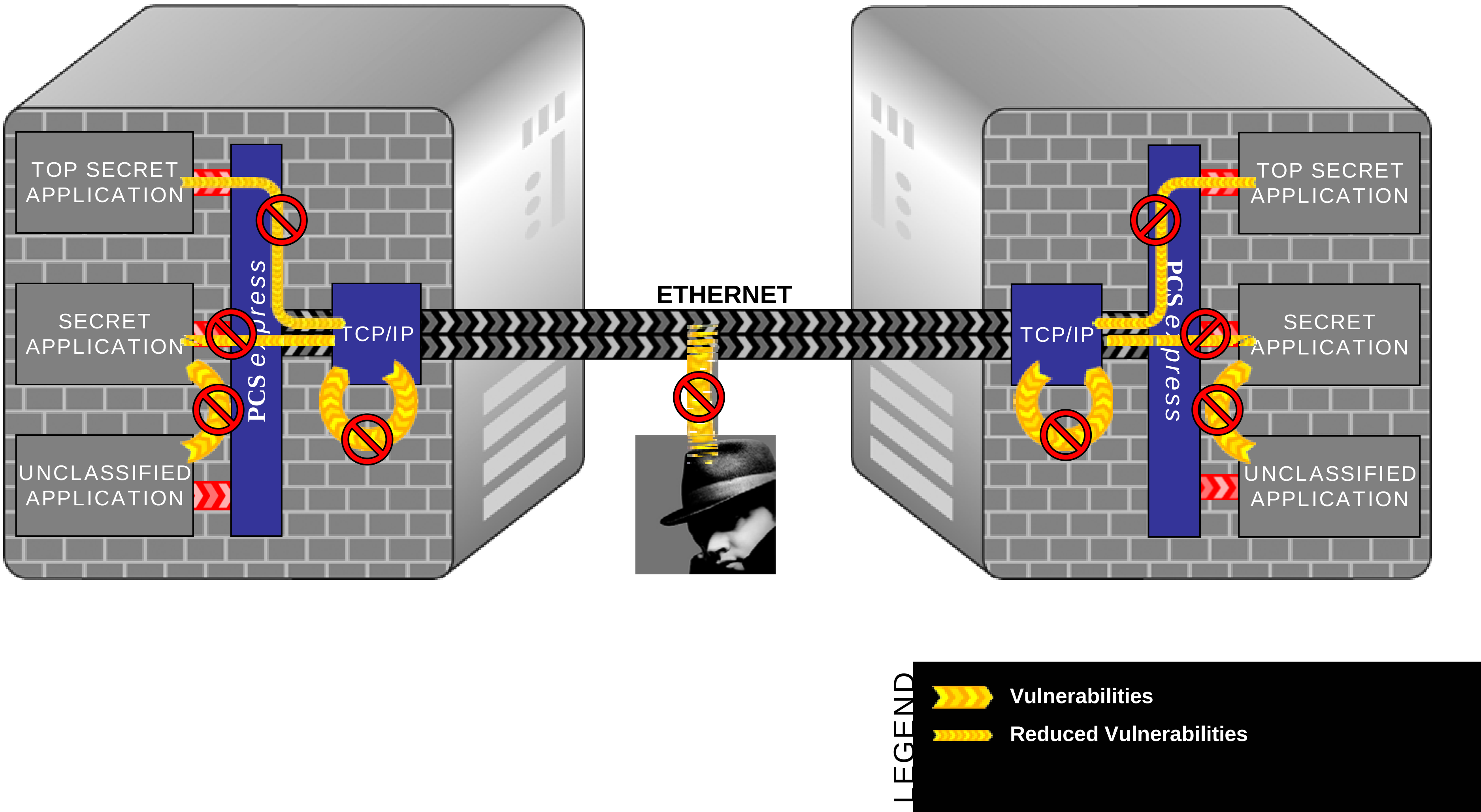
- Vulnerabilities
- Reduced Vulnerabilities

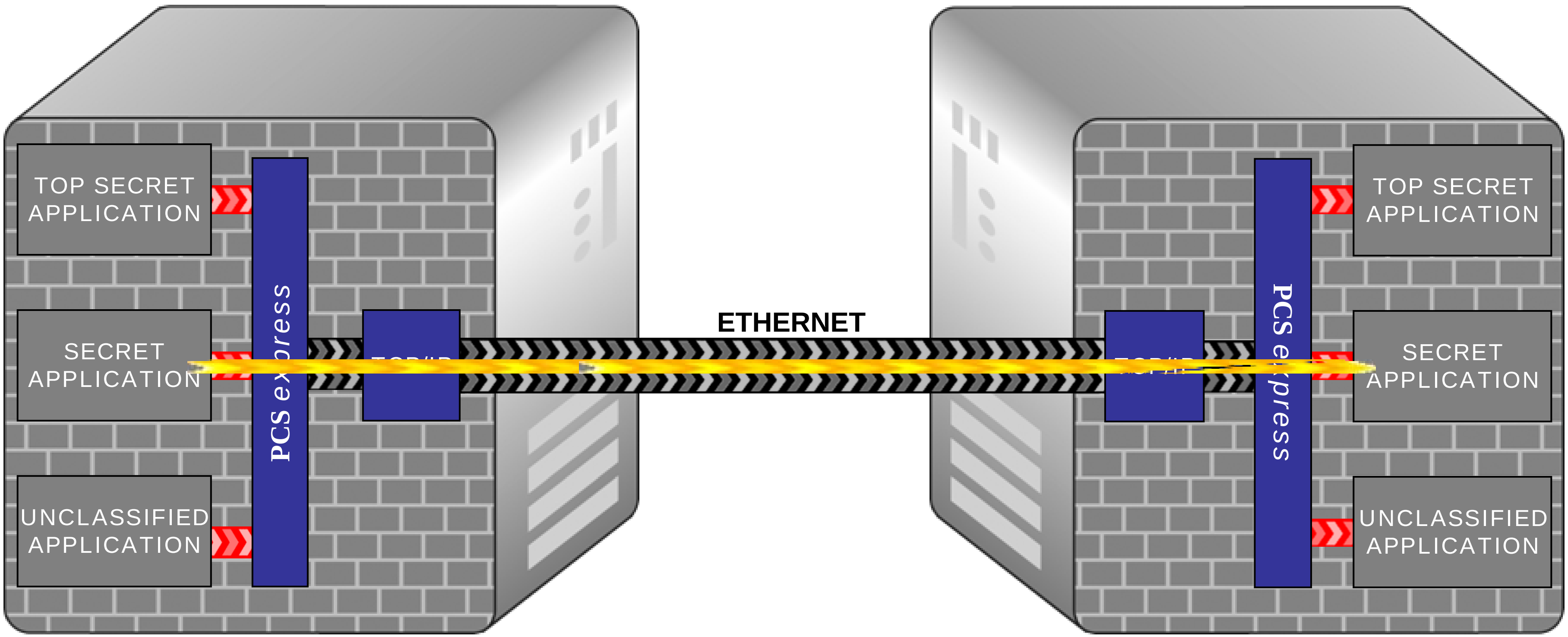
PCSexpress Completes MILS Separation Kernel

Smart Push, Smart Pull, Sensor to Shooter in a Multi-Level Secure/Safe (MLS) Infrastructure



Guards Still Needed for Intra-level Threats

Smart Push, Smart Pull, Sensor to Shooter in a Multi-Level Secure/Safe (MLS) Infrastructure



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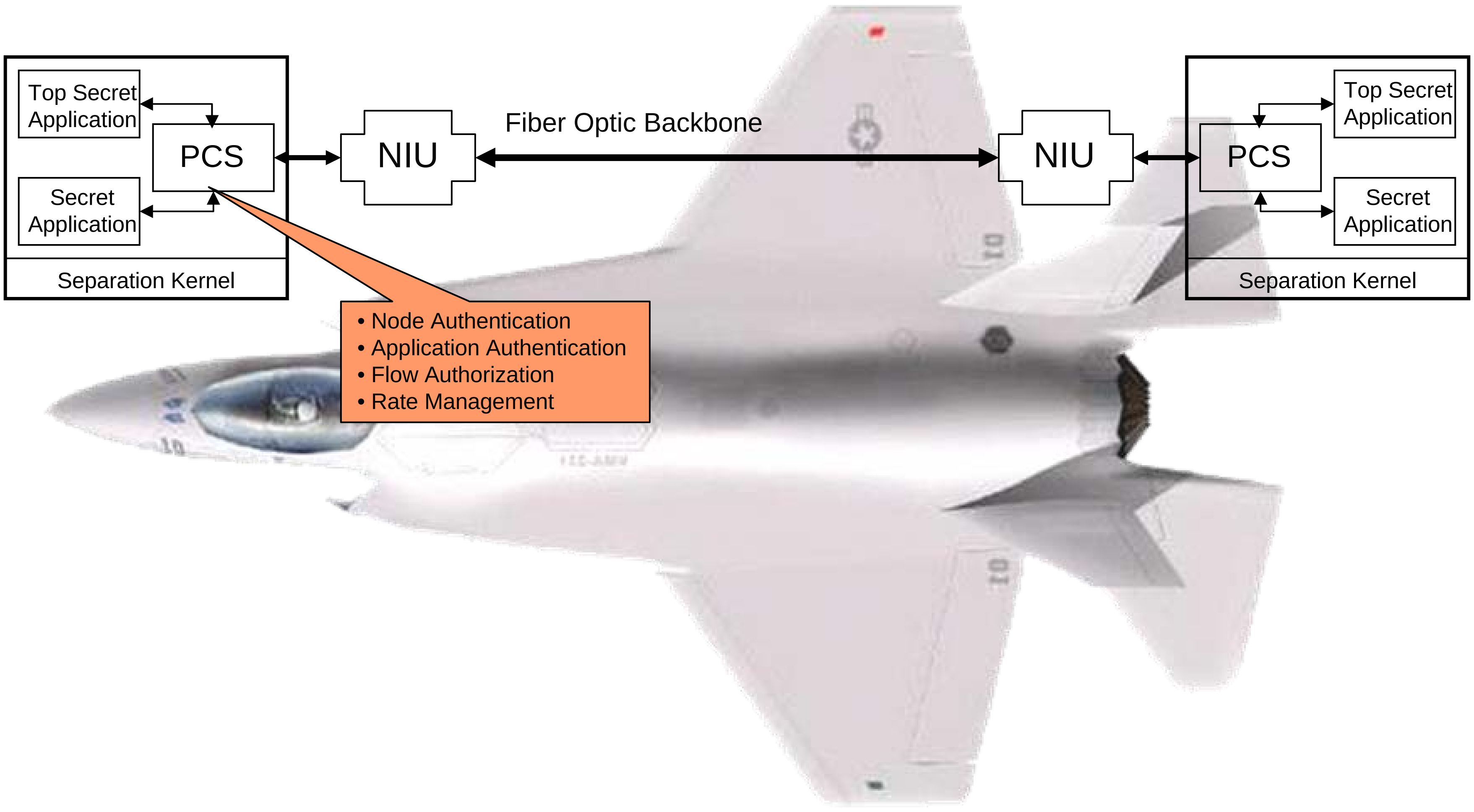
Multiple Vulnerabilities

Data Vulnerabilities

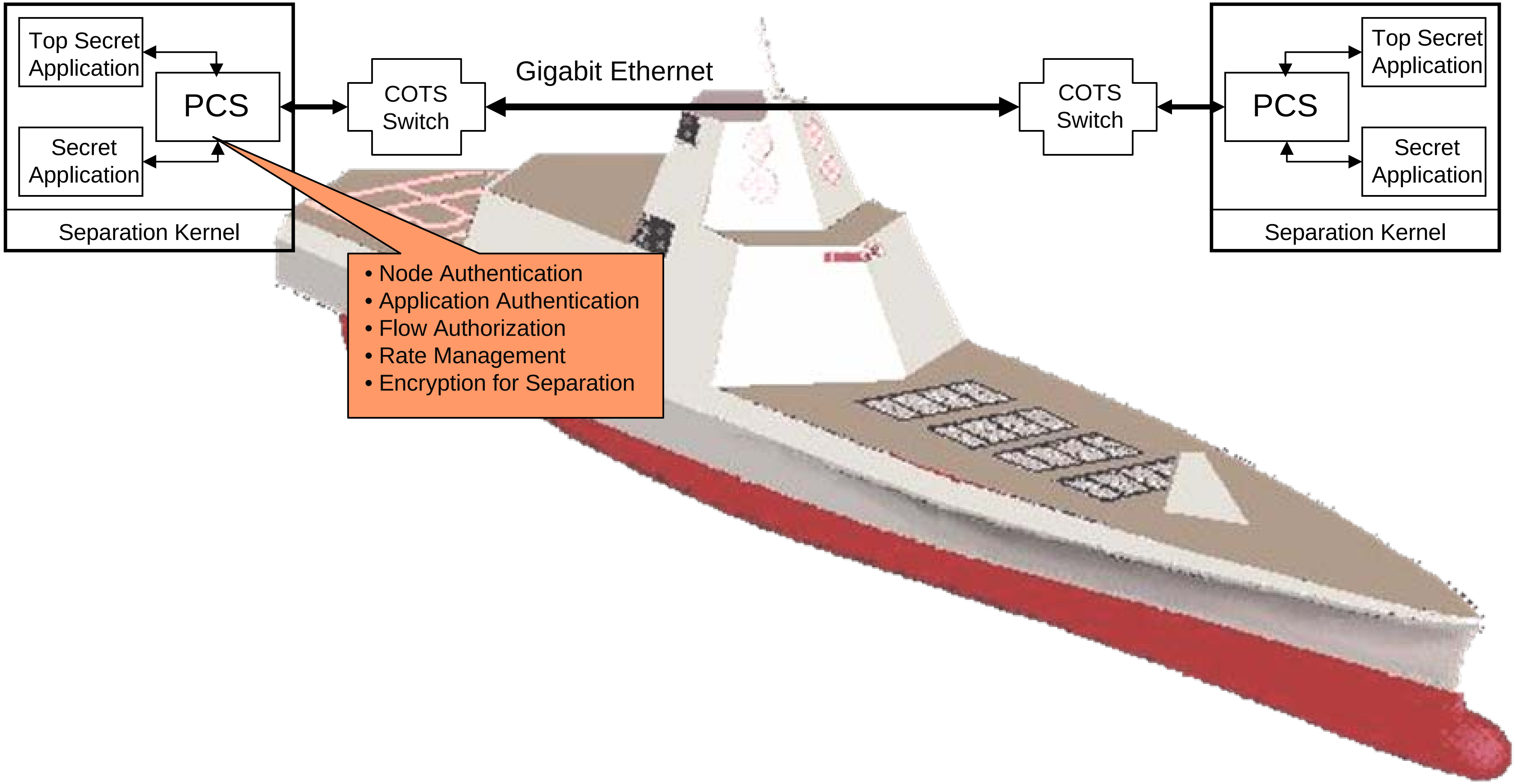
Use Cases: Definition of Terms

- Trusted Transport
  - Communications system can be trusted to maintain separation by level and Community of Interest
- Untrusted Transport
  - Communications system cannot be trusted to maintain separation by level and Community of Interest
- Gray Sky
  - Threats to communications confidentiality are acceptably low
    - Example: Front to back of an airplane or submarine; within an FCS tank
- Blue Sky
  - Threats to communications confidentiality are unacceptably high
    - Example: Radio transmission; the Internet

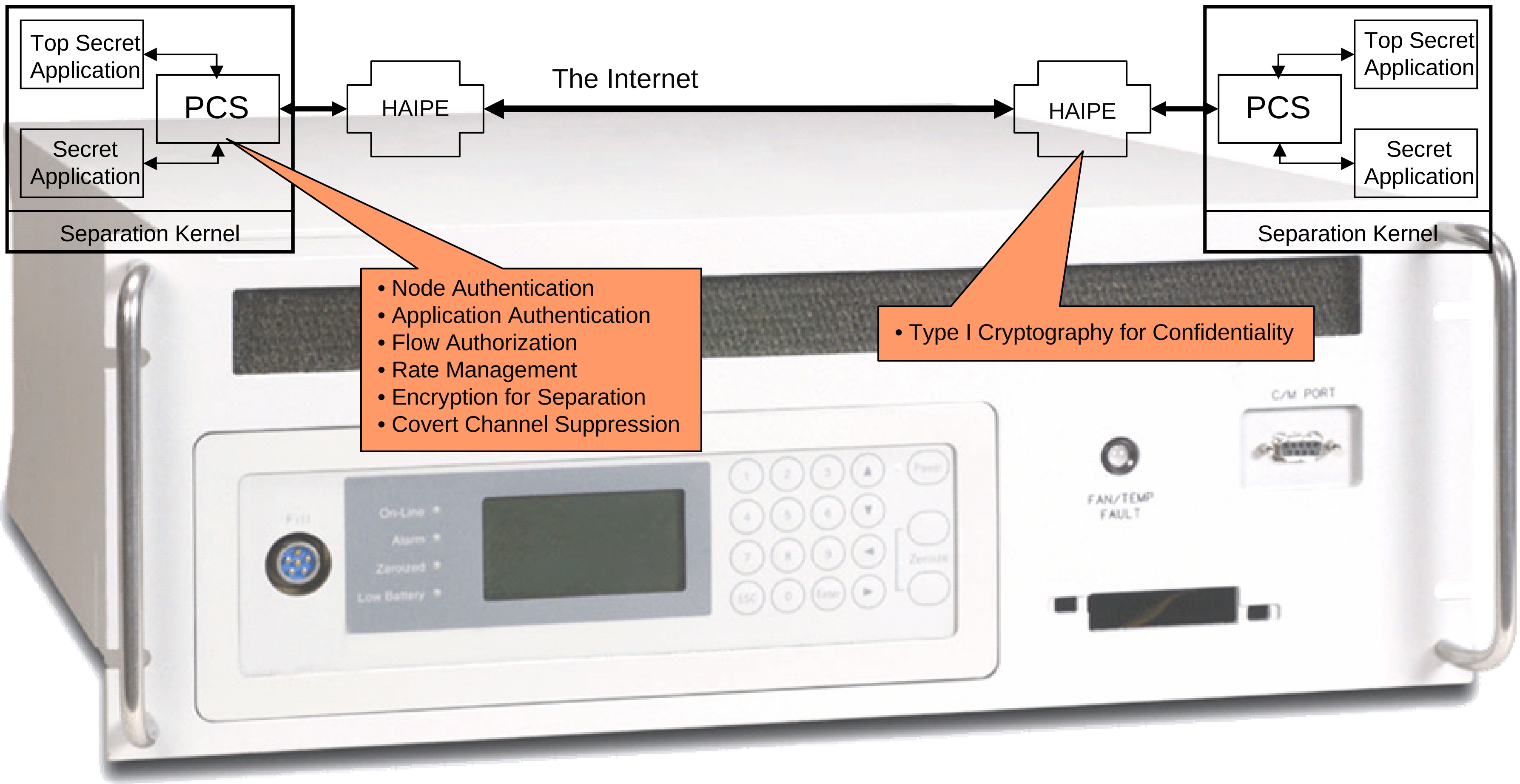


Top Secret Application
Secret Application
PCS
Separation Kernel
NIU
Fiber Optic Backbone
NIU
PCS
Top Secret Application
Secret Application
Separation Kernel
• Node Authentication
• Application Authentication
• Flow Authorization
• Rate Management

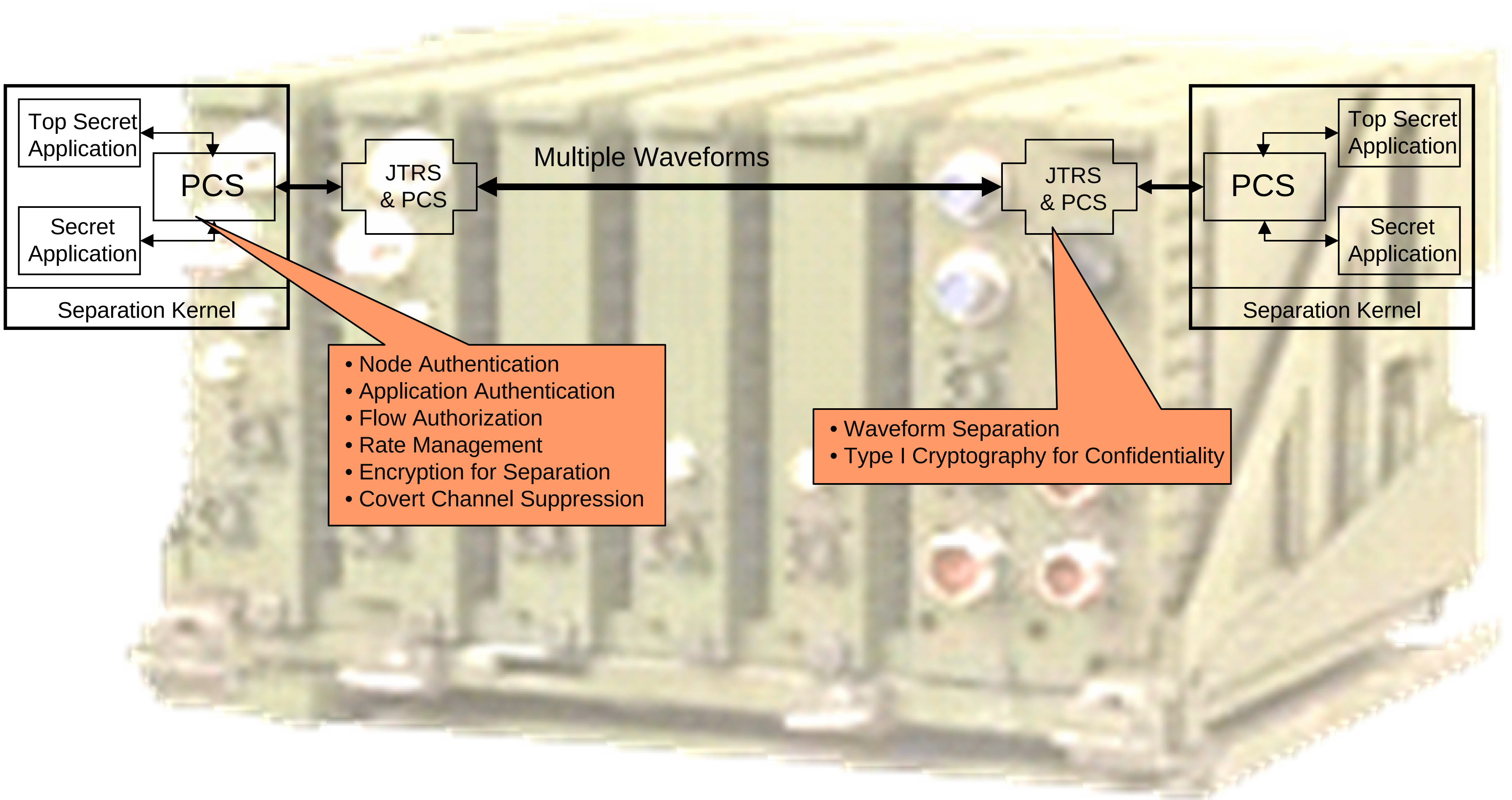
Untrusted Transport, Gray Sky



Untrusted Transport, Blue Sky



Smart Push, Smart Pull, Sensor to Shooter in a Multi-Level Secure/Safe (MLS) Infrastructure



Real-time MILS CORBA

- Real-time CORBA can take advantage of PCS capabilities
  - Real-time CORBA + PCS = Real-time MILS CORBA
  - Additional application-level security policies are enforceable because of MILS SK and PCS foundation

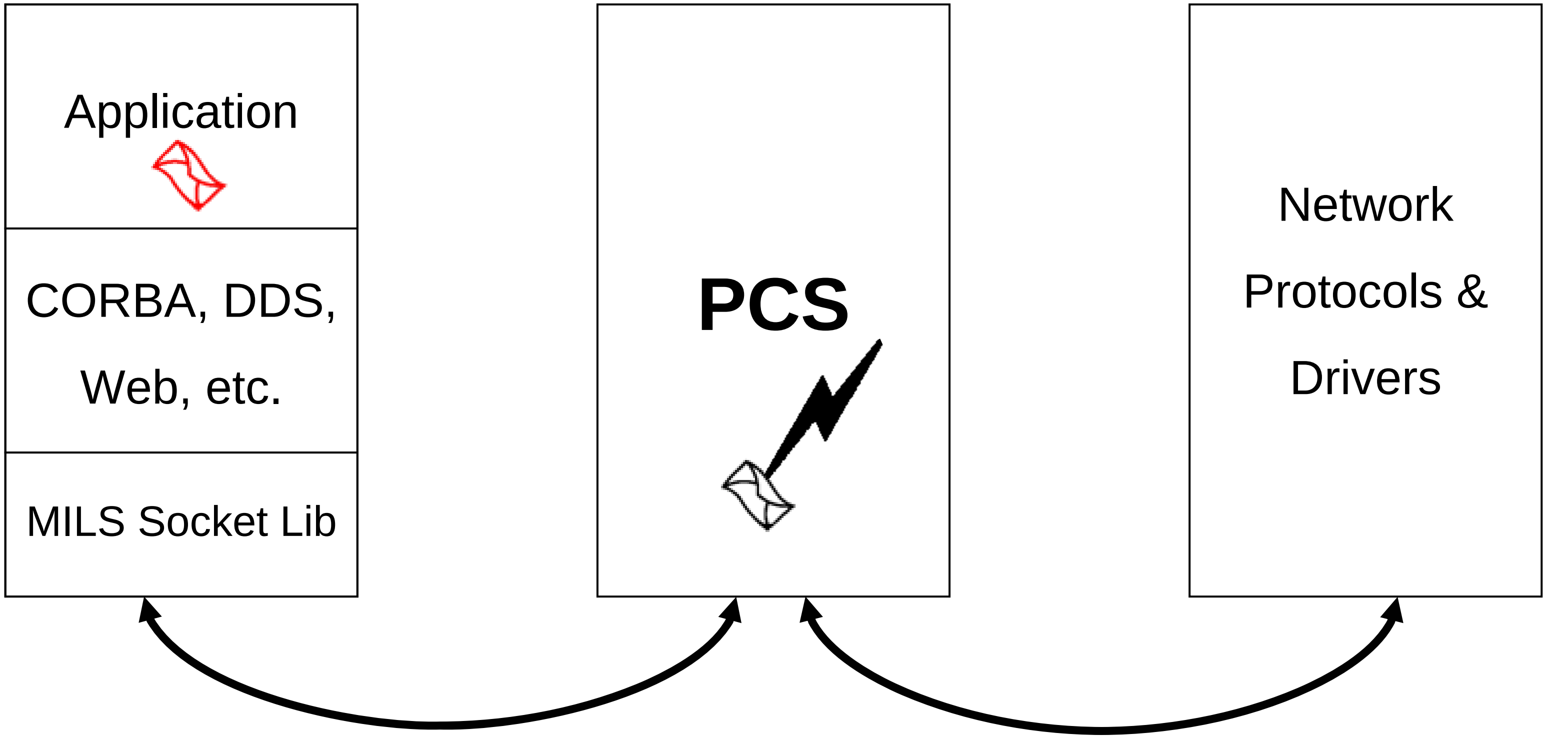
- Real-time MILS CORBA represents a single enabling application infrastructure

Real-time MILS CORBA (cont.)

- Can address key cross-cutting system requirements
- MILS-based distributed security
  - High-assurance
  - High-integrity (safety critical systems)
- Real-time
  - Fixed priority
  - Dynamic scheduling
- Distributed object communications
  - Predictable
  - Low latency
  - High bandwidth

- Synthesis yields an unexpected benefit
  - Flexibility of Real-time CORBA allows realization of MILS protection
  - **MILS is all about location awareness**
    - Well designed MILS system separates functions into separate partitions
    - Takes advantage of the MILS partitioning protection
  - **Real-time CORBA is all about location transparency**
    - The application code of a properly designed distributed system built with Real-time CORBA will not be aware of the location of the different parts of the system.
    - CORBA flexibility allows performance optimizations by rearranging what partitions each system object executes in.
    - System layout can be corrected late in the development cycle
  - **Combination of MILS and Real-time CORBA allows system designer to**
    - ***Rearrange system functions to take advantage of protection without introducing new threats to data confidentiality and integrity***

System Architecture with PCS



Acronyms

CCEVS:	Common Criteria Evaluation Scheme
CCRA:	Common Criteria Recognition Arrangement
CMMI:	Capability Maturity Model Integration
COI:	Community of Interest
COMINT:	Communications Intelligence
CONUS:	Continental United States
CORBA:	Common Object Resource Broker Architecture
DCID:	Director of Central Intelligence Directive
DDS:	Data Distribution Service
EAL:	Evaluation Assurance Level
ELINT:	Electronic Intelligence
GIOP:	General Inter-Orb Protocol
HAIPE:	High Assurance Internet Protocol Equipment
HTTP:	Hypertext Transfer Protocol
HUMINT:	Human Intelligence
IAD:	Information Assurance Directorate
IATF:	Information Assurance Technical Framework
IBAC:	Identity Based Access Control
IMINT:	Imagery Intelligence
JTRS:	Joint Tactical Radio System
MILS:	Multiple Independent Levels of Security
MLS:	Multi-Level Security/Safety
NSA:	National Security Agency
PCS:	Partitioning Communications System
RBAC:	Role Based Access Control
SEI:	Software Engineering Institute (Carnegie Mellon)
SIGINT:	Signals Intelligence
SKPP:	Separation Kernel Protection Profile
SOA:	Services Oriented Architecture
SRD:	System Requirements Document
TOE:	Target of Evaluation
TSF:	TOE Security Functions